JEE Main April 2024

Question Paper With Text Solution

08 April | Shift-1

CHEMISTRY

MATRIX

JEE Main & Advanced | XI-XII Foundation| VI-X Pre-Foundation

Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911

Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in

61. Combustion of glucose ($C_6H_{12}O_6$) produces CO_2 and water. The amount of oxygen (in g) required for the complete combustion of 900 g of glucose is :

[Molar mass of glucose in g mol^{-1} = 180]

(1) 32 (2) 480 (3) 800 (4) 960

Question ID: 68019114394

Ans. Official Answer by NTA (4)

Sol. $C_6H_{12}O_6 + CO_2 \rightarrow 6O_2 + 6H_2O$

$n_{O_2} = 6n_{glucose}$ Mass O_2

$= 6 \times \frac{900}{180}$ $= 30 \times 32$

$= 6 \times 5$ $= 960$

$= 30$

62. Given below are two statements :

Statement I : $N(CH_3)_3$ and $P(CH_3)_3$ can act as ligands to form transition metal complexes.

Statement II : As N and P are from same group, the nature of bonding of $N(CH_3)_3$ d and $P(CH_3)_3$ is always same with transition metals.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Both Statement I and Statement II are correct.

(2) Statement I is correct but Statement II is incorrect.

(3) Statement I is incorrect but Statement Ii is correct.

(4) Both Statement I and Statement II are incorrect.

Question ID: 68019114400

Ans. Official Answer by NTA (2)

Sol. P has vacant 3d so it can facilitate back bonding.

63. Iron (III) catalyses the reaction between iodide and persulphate ions, in which

A. Fe^{3+} oxidises the iodide ion

B. Fe^{3+} oxidises the persulphate ion

C. Fe^{2+} reduces the iodide ion

D. Fe^{2+} reduces the persulphate ion

Choose the most appropriate answer from the options given below :

(1) A only (2) A and D only (3) B only (4) B and C only

Question ID: 68019114402

Ans. Official Answer by NTA (2)

Sol. $Fe^{3+} + I^- \rightarrow Fe^{2+} + I_2$

$Fe^{2+} + S_2O_8^{2-} \rightarrow Fe^{3+} + SO_4^{2-}$

64. Match List I with List II

List I (Compound)	**List II (Colour)**
A. $Fe_4[Fe(CN)6]_3 \cdot xH_2O$	I. Violet
B. $[Fe(CN)_5NOS]^{4-}$	II. Blood Red
C. $[Fe(SCN)]^{2+}$	III. Prussian Blue
D. $(NH_4)_3PO_4 \cdot 12MoO_3$	IV. Yellow

Choose the correct answer from the options given below :

(1) A-II, B-III, C-IV, D-I (2) A-IV, B-I, C-II, D-III

(3) A-III, B-I, C-II, D-IV (4) A-I, B-II, C-III, D-IV

Question ID: 68019114406

Ans. Official Answer by NTA (3)

Sol. Fact based

65. Match List I with List II

List - I (Name of the test)	**List - II (Reaction sequence involved) [M is metal]**
A. Borax bead test	I. $MCO_3 \rightarrow MO \xrightarrow[+\Delta]{Co(NO_3)_2} CoO \cdot MO$
B. Charcoal cavity test	II. $MCO_3 \rightarrow MCl_2 \rightarrow M^{2+}$
C. Cobalt nitrate test	III. $MSO_4 \xrightarrow[\Delta]{Na_2B_4O_7} M(BO_2)_2 \rightarrow MBO_2 \rightarrow M$
D. Flame test	IV. $MSO_4 \xrightarrow[\Delta]{Na_2CO_3} MCO_3 \rightarrow MO \rightarrow M$

Choose the correct answer from the options given below :

(1) A-III, B-IV, C-I, D-II (2) A-III, B-I, C-II, D-IV

(3) A-III, B-II, C-IV, D-I (4) A-III, B-I, C-IV, D-II

Question ID: 68019114405

Ans. Official Answer by NTA (1)

Sol. Fact based

66. Given below are two statements : One is labelled **Assertion A** and the other is labelled as **Reason R** :

Assertion A : The stability order of +1 oxidation state of Ga, In and Tl is Ga < In < Tl.

Reason R : The inert pair effect stabilizes the lower oxidation state down the group.

In the light of the above statements, choose the correct answer from the options given below :

(1) Both A and R are true and R is the correct explanation of A.

(2) A is true but R is false.

(3) A is false but R is true.

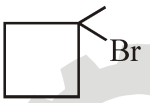
(4) Both A and r are true but R is NOT the correct explanation of A.

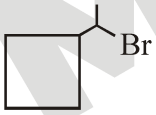
Question ID: 68019114399

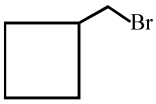
Ans. Official Answer by NTA (1)

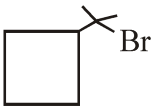
Sol. Fact based stability of +3 decreases down the group.

67. Which among the following compounds will undergo fastest S_N2 reaction.

(1) 

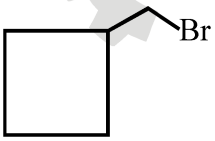
(2) 

(3) 

(4) 

Question ID: 68019114410

Ans. Official Answer by NTA (3)

Sol. 

1° halide least steric hinderance.

68. An octahedral complex with the formula $CoCl_3.nNH_3$ upon reaction with excess of $AgNO_3$ solution gives 2 moles of AgCl. Consider the oxidation state of Co in the complex is 'x'. The value of "x + n" is _____.

(1) 6 (2) 3 (3) 8 (4) 5

Question ID: 68019114403

Ans. Official Answer by NTA (3)

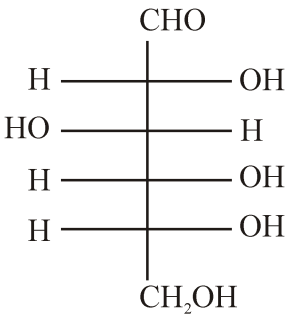
Sol. $\left[Co\left(NH_3\right)_5 Cl\right]Cl_2 + 2AgNO_3 \rightarrow 2AgCl\downarrow + \left[Co\left(NH_3\right)_5 Cl\right]\left(NO_3\right)_2 + \left[Co\left(NH_3\right)_5 Cl\right]^{+2}$

Co is in +3 state.

n = 5

x = 3

69.



The incorrect statement regarding the given structure is

(1) has 4 asymmetric carbon atom

(2) will coexist in equilibrium with 2 other cyclic structure

(3) can be oxidized to a dicarboxylic acid with Br_2 water

(4) despite the presence of –CHO does not give Schiff's test

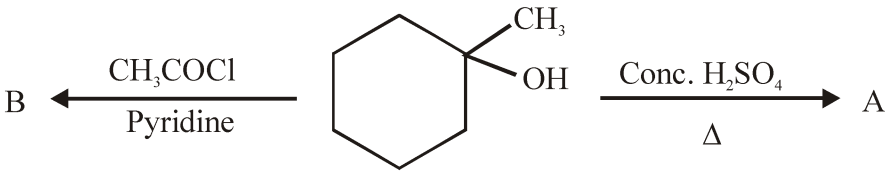
Question ID: 68019114413

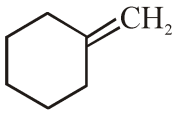
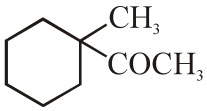
Ans. Official Answer by NTA (3)

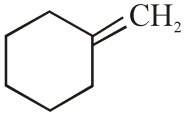
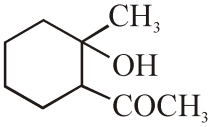
Sol. $\underset{1}{CHO} \xrightarrow[H_2O]{Br_2} \underset{1}{COOH}$

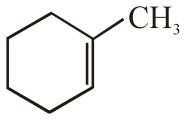
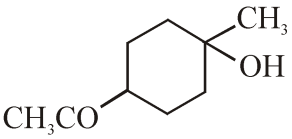
only aldehyde

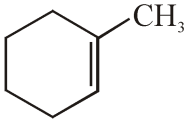
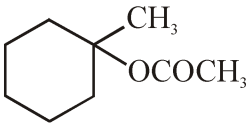
70. Identify the major products A and B respectively in the following set of reactions.



(1) A =  and B = 

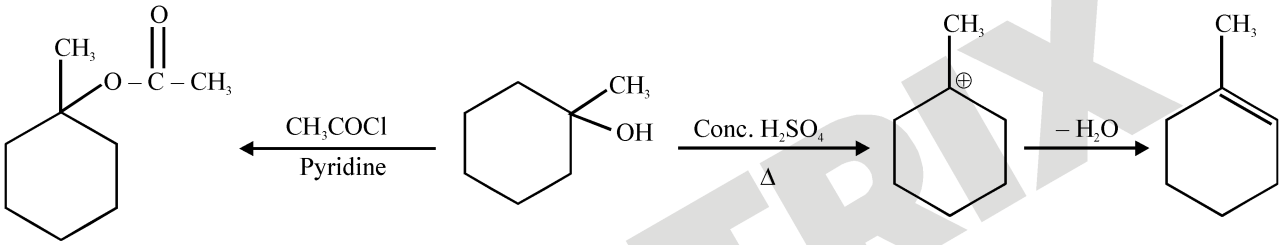
(2) A =  and B = 

(3) A =  and B = 

(4) A =  and B = 

Question ID: 68019114411

Ans. Official Answer by NTA (4)

Sol. 

71. Match List I with List II

List I	**List II**
(Elements)	**(JProperties in their respective groups)**
A. Cl, S	I. Elements with highest electronegativity
B. Ge, As	II. Elements with largest atomic size
C. Fe, Ra	III. Elements which show properties of the metals and non-metal
D. F, O	IV. Elements with highest negative electron gain enthalpy

Choose th correct answer from the options given below :

(1) A-II, B-I, C-IV, D-III (2) A-II, B-III, C-IV, D-I

(3) A-III, B-II, C-I, D-IV (4) A-IV, B-III, C-II, D-I

Question ID: 68019114401

Ans. Official Answer by NTA (4)

Sol. Fact based

72. Number of Complexes with even number of electrons in t_{2g} orbitals is -

$[Fe(H_2O)_6]^{2+}$, $[Co(H_2O)_6]^{2+}$, $[Co(H_2O)_6]^{3+}$, $[Cu(H_2O)_6]^{2+}$, $[Cr(H_2O)_6]^{2+}$

(1) 3 (2) 2 (3) 1 (4) 5

Question ID: 68019114404

Ans. Official Answer by NTA (1)

Answer by Matrix is (4)

Sol. $Fe^{2+} \rightarrow 3d^6 4s^0$

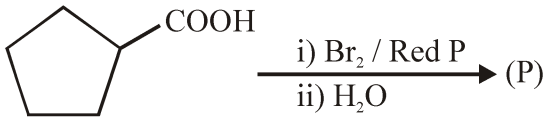
$Co^{2+} \rightarrow 3d^7 4s^0$

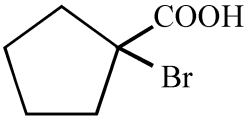
$Co^{3+} \rightarrow 3d^6 4s^0$

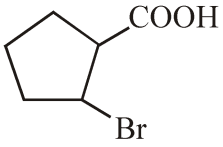
$Cu^{2+} \rightarrow 3d^9 4s^0$

$Cr^{2+} \rightarrow 3d^3 4s^0$ odd

73. Identify the product (P) in the following reaction :



(1) 

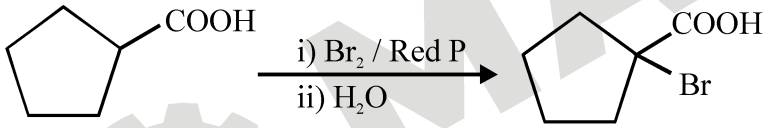
(2) 

(3) 

(4) 

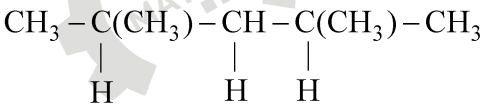
Question ID: 68019114412

Ans. Official Answer by NTA (1)

Sol. 

HVZ reaction does $\propto$ halogenation on carboxylic acid.

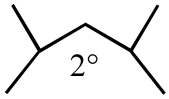
74. In the given compound, the number of 2° carbon atom/s is _____ .



(1) Two (2) Three (3) One (4) Four

Question ID: 68019114408

Ans. Official Answer by NTA (3)

Sol. 

75. For the given hypothetical reactions, the equilibrium constants are as follows :

$X \rightleftharpoons Y; K_1 = 1.0$

$Y \rightleftharpoons Z; K_2 = 2.0$

$Z \rightleftharpoons W; K_3 = 4.0$

The equilibrium constant for the reaction $X \rightleftharpoons W$ is -

(1) 7.0 (2) 12.0 (3) 6.0 (4) 8.0

Question ID: 68019114396

Ans. Official Answer by NTA (4)

Sol. Add all the 3 equations

$K_{net} = K_1 \times K_2 \times K_3 = 8$

76. Thiosulphate reacts differently with iodine and bromine in the reactions given below :

$2S_2O_3^{2-} + I_2 \rightarrow S_4O_6^{2-} + 2I^-$

$S_2O_3^{2-} + 5Br_2 + 5H_2O \rightarrow 2SO_4^{2-} + 4Br^- + 10H^+$

Which of the following statement justifies the above dual behaviour of thiosulphate ?

(1) Bromine undergoes oxidation and iodine undergoes reduction in these reactions

(2) Bromine is a weaker oxidant than iodine

(3) Bromine is a stronger oxidant than iodine

(4) Thiosulphate undergoes oxidation by bromine and reduction by iodine in these reactions

Question ID: 68019114397

Ans. Official Answer by NTA (3)

Sol. Br_2 is stronger OA than I_2.

77. Match List I with List II

List I (Molecule)	**List II (Shape)**
A. NH_3	I. Square pyramid
B. BrF_5	II. Tetrahedral
C. PCl_5	III. Trigonal pyramidal
D. CH_4	IV. Trigonal bipyramidal

Choose the correct answer from the options given below :

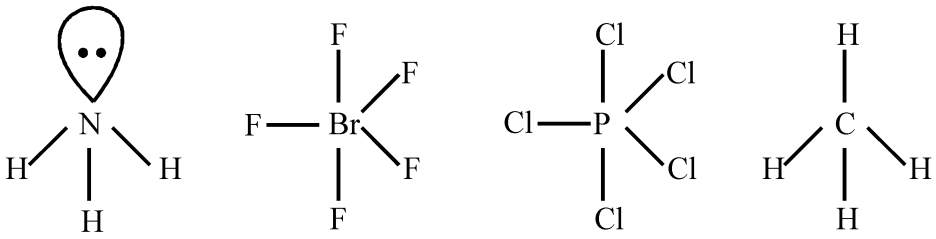
(1) A-III, B-IV, C-I, D-II (2) A-III, B-I, C-IV, D-II

(3) A-II, B-IV, C-I, D-III (4) A-IV, B-III, C-I, D-II

Question ID: 68019114395

Ans. Official Answer by NTA (2)

Sol.



78. Among the following halogens F_2, Cl_2, Br_2 and I_2 which can undergo disproportion reactions ?

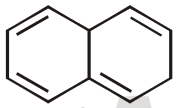
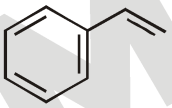
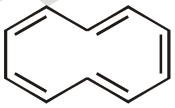
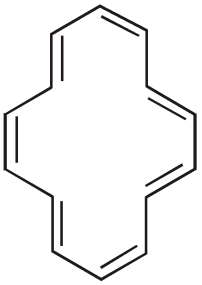
(1) F_2, Cl_2 and Br_2 (2) F_2 and Cl_2 (3) Only I_2 (4) Cl_2, Br_2 and I_2

Question ID: 68019114398

Ans. Official Answer by NTA (4)

Sol. F_2 can only show 0 and –1 oxidation state.

79. Which of the following are aromatic ?

(A)  (B)  (C)  (D) 

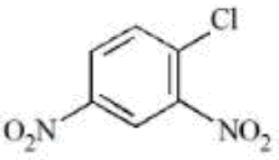
(1) C and D only (2) B and D only (3) A and C only (4) A and B only

Question ID: 68019114409

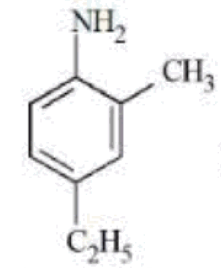
Ans. Official Answer by NTA (2)

Sol. Fact based.

80. Given below are two statments :

Statement I : 

Compound A IUPAC name of Compound A is 4-chloro-1, 3-dinitrobenzene.

Statement II : 

Compound B

IUPAC name of Compound B is 4-ethyl-2-methylaniline.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) Statement I is correct but Statement II is incorrect.

(2) Statement I is incorrect but Statement II is correct.

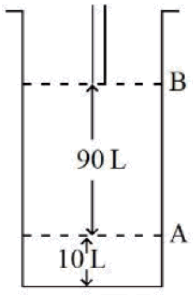
(3) Both Statement I and Statement II are incorrect.

(4) Both Statment I and Statement II are correct.

Question ID: 68019114407

Ans. Official Answer by NTA (2)

Sol. Correct name : 1–chloro 2,4 dinitrobenzene

81. 

Consider the figure provided.
1 mol of an ideal gas is kept in a cylinder, fitted with a pistion, at the position A, at 18°C. If the pistion is moved to position B, keeping the temperature unchanged, then 'x' L atm work is done in this reversible process.
x = _____ L atm. (nearest integer)

[Given : Absolute temperature = °C + 273.15, R = 0.08206 L atm mol^{-1} K^{-1}]

Question ID: 68019114416

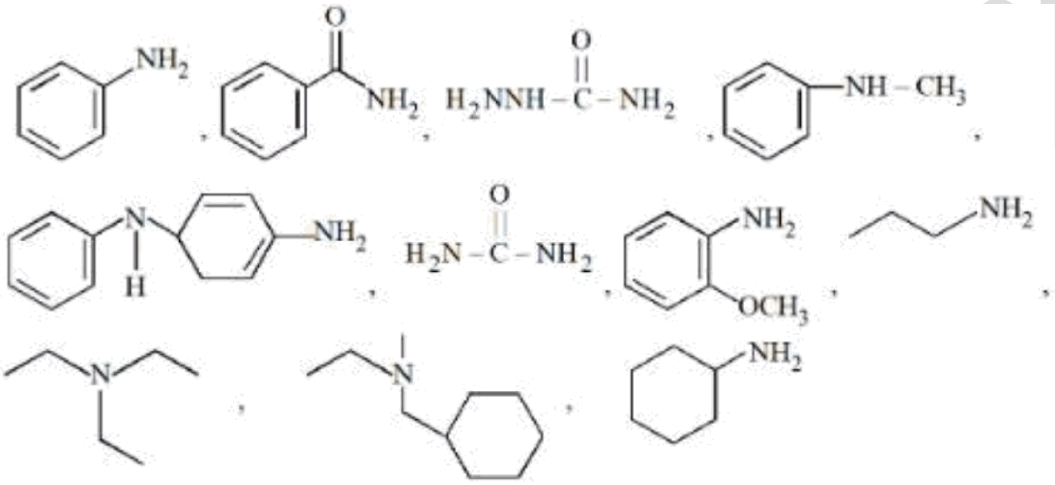
Ans. Official Answer by NTA (–55)

Sol. $w = -nRT \ln \frac{V_2}{V_1}$

$= -1 \times 0.08206 \times (18 + 273.15) \ln \frac{100}{10}$

$= -55$

82. Number of amine compounds from the following giving solids which are soluble in NaOH upon reaction with Hinsberg's reagent is _____.



Question ID: 68019114423

Ans. Official Answer by NTA (5)

Sol. 1° amine give this test completely.

83. A solution containing 10 g of an electrolyte AB_2 in 100 g of water boils at 100.52°C. The degree of ionization of the electrolyte (α) is _____ $\times 10^{-1}$. (nearest integer)

[Given : Molar mass of $AB_2 = 200$ g mol^{-1}, Kb (molal boiling point elevation const. of wather) = 0.52 K kg mol^{-1}, boiling point of water 100°C; AB_2 ionises as $AB_2 \rightarrow A^{2+} + 2B^-$]

Question ID: 68019114417

Ans. Official Answer by NTA (5)

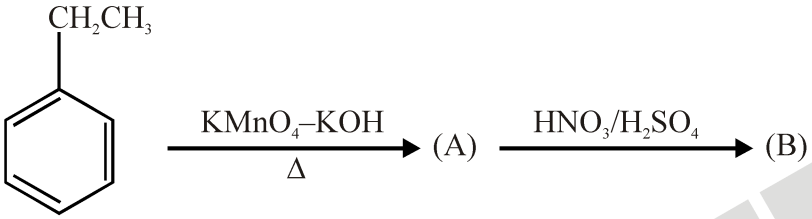
Sol. $\Delta T_f = 0.52 = iK_f M$

$$0.52 = i \times 0.52 \times \frac{\frac{10}{200}}{\frac{100}{1000}}$$

$i = 2$

$$\alpha = \frac{i-1}{b-1} = \frac{2-1}{3-1} = 0.5 = 5 \times 10^{-1}$$

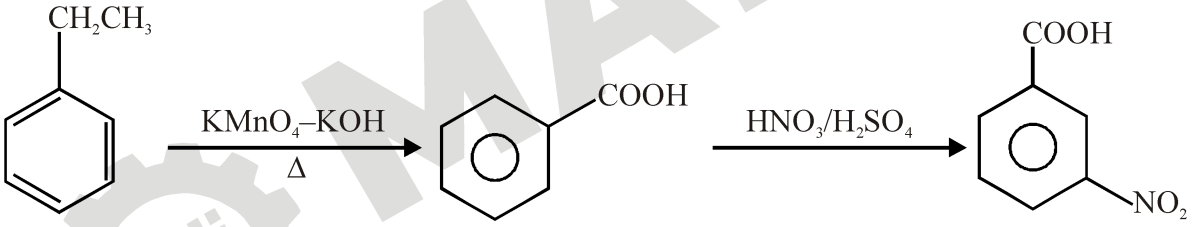
84. Major product B of the following reaction has _____ π-bond.



Question ID: 68019114422

Ans. Official Answer by NTA (5)

Sol.

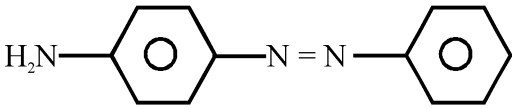


85. If 279 g of aniline is reacted with one equivalent of benzenediazonium chloride, the maximum amount of aniline yellow formed will be _____ g. (nearest integer) (consider complete conversion).

Question ID: 68019114420

Ans. Official Answer by NTA (591)

Sol.



dye

$n_{aniline} = n_{dye}$

Mass = n × M.mass

$= \frac{279}{93} \times 197 = 591$

86. Consider the following reaction

$A + B \rightarrow C$

The time taken for A to become 1/4th of its initial concentration is twice the time taken to become 1/2 of the same. Alos, when the change of concentration of B is plotted against time, the resulting graph gives a straight line with a negative slope and a positive intercept on the concentration axis.

The overall order fo the reaction is _____ .

Question ID: 68019114418

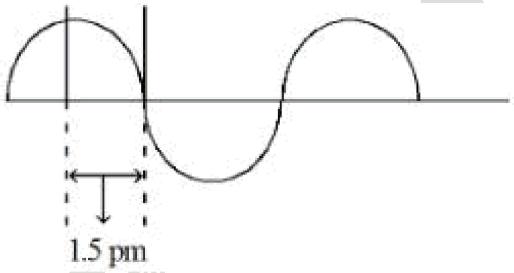
Ans. Official Answer by NTA (1)

Sol. Zero order $C_t = C_0 - kt$

slope = – K so B

First order $C_0 \xrightarrow{t_{1/2}} C_0/2 \xrightarrow{t_{1/2}} C_0/4$

87. A hypothetical electromagnetic wave is show below.



The frequency of the wave is x × 10^{19} Hz.

x = _____ (nearest integer)

Question ID: 68019114414

Ans. Official Answer by NTA (5)

Sol. $v_0 = \frac{C}{\lambda}$

$= \frac{3\times10^8}{4\times1.5\times10^{-12}}$

$= \frac{1}{2}\times10^{20} = 5\times10^{19}$

88. Number of molecules from the following which are exceptions to octet rule is _____.

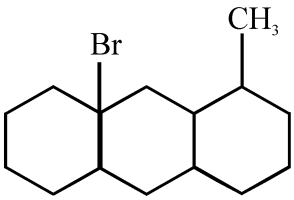
CO_2, NO_2, H_2SO_4, BF_3, CH_4, SiF_4, ClO_2, PCl_5, BeF_2, C_2H_6, $CHCl_3$, CBr_4

Question ID: 68019114415

Ans. Official Answer by NTA (6)

Sol. BF_3, PCl_5, ClO_2, NO_2, BeF_2, H_2SO_4, defy octet rule.

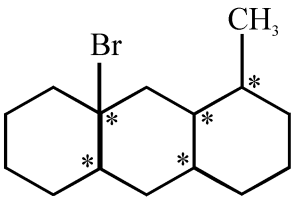
89. The number of optical isomers in following compound is : _____



Question ID: 68019114421

Ans. Official Answer by NTA (32)

Sol.



$2^5 = 32$ = No. of optical isomers.

90. The 'spin only' magnetic moment value of MO_4^{2-} is _____ BM. (Where M is a metal having least metallic radii. among Sc, Ti, V, Cr, Mn and Zn).

(Given atomic number : Sc = 21, Ti = 22, V = 23, Cr = 24, Mn = 25 and Zn = 30)

Question ID: 68019114419

Ans. Official Answer by NTA (0)

Sol. Cr = 129 pm

CrO_4^{2-}

Cr^{+6} $3d^0 4s^0$.